Defining the floristic community Coastal Moonah Woodland in the Gippsland Plain bioregion

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Abstract

The floristic community Coastal Moonah Woodland is listed as a threatened community under the *Flora and Fauna Guarantee Act 1988*, and remaining stands are often highly degraded. The distribution and composition of this community across its range has been poorly defined, which has proved problematic for land managers and planners. This paper refines the description of Coastal Moonah Woodland in the Gippsland Plain bioregion, provides a workable definition of the community, determines its relationships with similar communities and develops a Key to the community that can be used by land managers, planners and environmental consultants. As well, a Key to the transition states of Coastal Moonah Woodland is provided and these communities are described. (*The Victorian Naturalist* **126** (2) 2009, 36-43)

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Introduction

Most of Victoria's Coastal Moonah Woodland has been cleared for residential, agricultural and other developments (DNRE 2002). Coastal Moonah Woodland is often the subject of planning disputes. Most remnants are small and have become degraded due to ongoing disturbances, such as recreational pressures and weed invasion (Calder 1975; Port Phillip Authority 1982). Most Coastal Moonah Woodland stands have experienced significant changes in species composition, community dynamics and physiognomy, resulting from the location of remnants in the landscape. Furthermore, modifications to disturbance regimes and other ecological processes make defining and classifying this vegetation community a challenge. For example, despite the community's name, either Moonah, Coast Tea-tree or Coast Beard-heath can dominate or co-dominate the canopy. As well, the community is not necessarily a woodland structure, with some contemporary expressions of the community a closed-shrubland or an open-forest. The sub-canopy structure of this community also varies—open forest remnants may have grassy or shrubby subsidiary strata. Community characteristics prior to European settlement may never be precisely known, although reasonable inferences can be made.

The label used for this vegetation community, 'Coastal Moonah Woodland', reflects only one of this community's condition states prior to European settlement (i.e. stands dominated by Moonah) and may also reflect our sense of loss of this attractive and distinctive version of the community.

There are differing opinions as to what constitutes the floristic community 'Coastal Moonah Woodland'. The Action Statement (DNRE 2002) identified that the definition offered as part of the original nomination for listing needed to be refined. Unfortunately, the 'definition' within the Action Statement does not identify which species or structural features of the community are critical to either the definition or the recognition of Coastal Moonah Woodland. Furthermore, there is scant guidance as to which criteria are critical in deciding whether a vegetation stand belongs in Coastal Moonah Woodland. The description in the Action Statement cannot be used as a practicable definition.

The definition in the current paper is based on a set of rules extracted from the academic literature, and uses the knowledge of various experts in vegetation metrics and with substantial field experience in Coastal Moonah Woodland. Hence, it is based on intimate field knowledge of this community and surround-

ing vegetation, a close inspection of the floristic quadrat data set maintained by the Department of Sustainability and Environment and a practical consideration of workability. The aim of this paper is to offer a definition of Coastal Moonah Woodland that provides a basis for recognising and classifying the community in relation to its species composition, its physiognomy and its dynamic ecological characteristics. This definition also describes the range of soil types on which Coastal Moonah Woodland occurs.

Definition and description of the floristic community Coastal Moonah Woodland in the Gippsland Plain bioregion

Definition:

Coastal Moonah Woodland is a vegetation community that occurs within alkaline heathlands, on consolidated surfaces and dune systems within 10 kilometres of the coast. The presence of three or more of the following plant taxa, usually within a hectare of the site, is diagnostic of the community - Acacia uncifolia, Pimelea serpyllifolia *subsp.* serpyllifolia, Wurmbea latifolia, Parietaria debilis *and/or* Melaleuca lanceolata *subsp.* lanceolata. *Its canopy is dominated by* Melaleuca lanceolata *subsp.* lanceolata *and/or* Leptospermum laevigatum *and/or* Leucopogon parviflorus. *Structurally, it may occur as a shrubland (open or closed) through to a low forest.* (Nomenclature follows Walsh and Stajsic 2007).

Description:

Coastal Moonah Woodland occurs within ten kilometres of the Victorian coast and mostly west of Cape Schanck. The community occurs within 500 to 800 mm mean annual rainfall that may fall during any season, although soil moisture is generally heightened in winter. Coastal Moonah Woodland occurs on coastal dune soils that are alkaline at moderate depth and often contain calcarenite. They may be neutral to slightly acidic at the surface. The soil usually consists of a coarse-grained sand, with some minor organic incorporation (grey/brown sands). Calcarenite nodules occur throughout this substrate. The soil may be well-drained but moist throughout winter with soil drying to 2-3 m depth in summer on the ridges and to 300 mm in the swales.

Within the coastal dune system, the community occurs in the swales, slacks and on upper south-facing slopes. Typically it does not occur on high exposed dunes or on headland tops. Similarly, it does not occur on the inland flats of aeolian secondary deposition.

The following native species in combination are faithful to this community in these landscapes: Broad-leafed Early Nancy *Wurmbea latifolia*, Shade Pellitory *Parietaria debilis*, Thyme Rice-flower *Pimelea serpyllifolia* subsp. *serpyllifolia*, Coast Wirilda *Acacia uncifolia* and Moonah *Melaleuca lanceolata* subsp. *lanceolata*. Other useful differential species include: Small-leaved Clematis *Clematis microphylla*, Coast Swainson-pea *Swainsona lessertiifolia*, Coast Tea-tree *Leptospermum laevigatum*, Coast Beard-heath *Leucopogon parviflorus*, Rare Bitter-bush *Adriana quadripartita*, Austral Carrot *Daucus glochidiatus* and Kidney-weed *Dichondra repens* (Calder 1975; SAC 1998). In Coastal Moonah Woodland, the canopy is dominated by Moonah and/or Coast Tea-tree and/or Coast Beard-heath or some combination of these with 'marginal species' that are frequent in adjoining communities and occasional within Coastal Moonah Woodland, including Sea Box *Alyxia buxifolia*, Cherry Ballart *Exocarpos cupressiformis* and Coast Twin-leaf *Zygophyllum billardierei*.

Coastal Moonah Woodland has a variable structure according to topographic position, the degree of exposure to coastal influences and the intensity and type of past disturbance (Fig. 1). In its most sheltered occurrences, it may be a low forest, while in exposed areas it may form an open or closed shrubland. Thus, the community ranges structurally from a low forest (open or closed), through low woodland and low open woodland to scrub (open or closed) and tall shrubland (open or closed).

Most former Coastal Moonah Woodland stands have experienced significant changes in species composition and abundances, resulting from modifications in disturbance regimes such as grazing, fire, soil nutrient supply and weed invasion (Calder 1975; JCVRFASC 2000). Disturbance regimes have influenced native plant diversity, community dynamics and the physiognomy of the community (DNRE 2002). Species that commonly increase under these new disturbance regimes include: Coast Tea-tree *Leptospermum laevigatum*, Bower Spinach *Tetragonia implexicoma*, Seaberry Saltbush *Rhagodia candolleana*, Rare Bitter-bush *Adriana quadripartita* and the exotics Panic

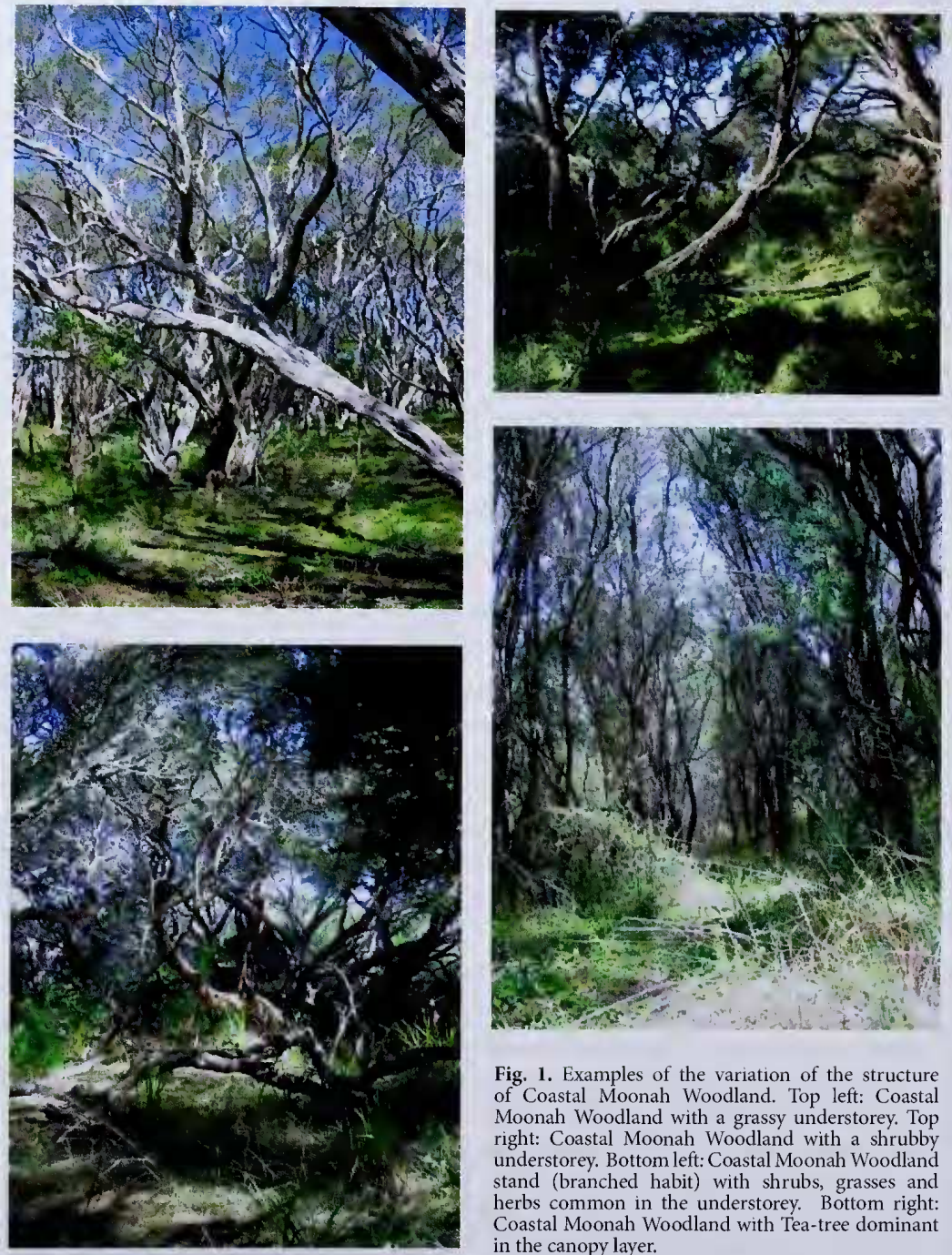

Fig. 1. Examples of the variation of the structure of Coastal Moonah Woodland. Top left: Coastal Moonah Woodland with a grassy understorey. Top right: Coastal Moonah Woodland with a shrubby understorey. Bottom left: Coastal Moonah Woodland stand (branched habit) with shrubs, grasses and herbs common in the understorey. Bottom right: Coastal Moonah Woodland with Tea-tree dominant in the canopy layer.

Veldt-grass *Ehrharta erecta*, Myrtle-leaf Milkwort *Polygala myrtifolia*, Italian Buckthorn *Rhamnus alaternus*, Bridal Creeper *Asparagus asparagoides*, Bladder Campion *Silene vulgaris*, Fumitory *Fumaria* spp., Cape Ivy *Delairea odorata*, Common Dipogon *Dipogon lignosus* and Crown Vetch *Securigera varia*. The native component of the community tends to decrease with anthropogenic disturbance.

Potential Coastal Moonah Woodland

Coastal Moonah Woodland once occupied large near-coastal areas of Victoria and is currently limited to small remnants that are usually degraded (Calder 1975; JCVRFASC 2000). Degradation may be attributed to the alteration of disturbance regimes, land clearance and weed invasion (Calder 1975; Port Phillip Authority 1982). This has left some stands of Coastal Moonah Woodland highly degraded, so that they no longer closely resemble the original community.

Such vegetation is variable in species composition and abundance and may be identified by several factors depending on disturbance history. Stands may lack Coast Wirilda, Moonah or Thyme Rice-flower, particularly after a disturbance event. Alternatively, Moonah or Thyme Rice-flower may be present but as very low numbers of individuals. There may be a loss of cover of indigenous species (to less than 5% of the total foliage cover). Exotic species may dominate the overall plant cover, to greater than 75% of the total foliage cover.

Vegetation stands that were once Coastal Moonah Woodland but have since become highly degraded, are no longer reasonably classified as Coastal Moonah Woodland. These remnants may be difficult to identify as former Coastal Moonah Woodland due to the paucity of definitive and characteristic species of Coastal Moonah Woodland and its lack of faithful differential species (Bridgewater 1981; Rieley and Page 1990; Rodwell 2006). Such vegetation stands may be considered 'Potential Coastal Moonah Woodland', as the characteristic component species of Coastal Moonah Woodland may be present in the soil seed bank and able to re-establish if the appropriate management regime is implemented.

A guide to potential transition states of Coastal Moonah Woodland is provided below. This information gives an indication of the likelihood of the vegetation regenerating into Coastal Moonah Woodland if the appropriate management regimes were implemented.

Saline Variant

A saline-influenced community dominated by Moonah exists in some localities such as Phillip and Churchill Islands. This floristic community is considered neither part of Coastal Moonah Woodland nor of the Ecological Vegetation Class (EVC) Coastal Alkaline Scrub *syn.* Calcarenite Dune Woodland (EVC 858) due to its occurrence on different soil types (Sutter and Downe 2000) and distinctively different species composition. It is distinguished from Coastal Moonah Woodland by the presence of two or more of the following species: Australian Salt-grass *Distichlis distichophylla*, Rounded Noon-flower *Disphyma crassifolium* subsp. *clavellatum*, Beaded Glasswort *Sarcocornia quinqueflora*, Austral Seablite *Suaeda australis*, Marsh Saltbush *Atriplex paludosa* subsp. *paludosa*, Sea Celery *Apium prostratum*, Creeping Brookweed *Samolus repens*, Knobby Clubsedge *Ficinia nodosa* and Salt Couch *Sporobolus virginicus* (Sutter and Downe 2000). Very large individuals of Moonah dominate the sparse canopy of this community type. Coast Wirilda is not present in this community and regeneration of Moonah canopy rarely has been observed. This community is very rare and requires further examination. It may be a result of sea level rise.

It should be noted also that non-coastal stands with some similarities to Coastal Moonah Woodland occur in the Mallee and Wimmera, and also require further examination.

Key 1: Coastal Moonah Woodland (and related coastal vegetation) in the Gippsland Plain Bioregion

This key has been developed for woody coastal (i.e. within 10 km of the coast) communities in the Gippsland Plain Bioregion. It is not definitive for Coastal Moonah Woodland in other bioregions (e.g. Otway Plain) although it may assist in recognising Coastal Moonah Woodland in other bioregions.

The key is not intended for application to very small patches of vegetation and should be used within a wider context (i.e. greater than one hectare) of the surrounding vegetation, occurring on similar substrates and in a similar topographic setting.

The key is an aid to recognition and thus may not include consideration of all the components of the definition. It is intended for use throughout the year. As such, certain seasonal components of Coastal Moonah Woodland, that are part of its definition, are not used in the key. The key also uses the Ecological Vegetation Class (EVC) classification system, which is the main vegetation unit in the hierarchy for classification used in vegetation management and planning in Victoria, Australia (Woodgate *et al.* 1996). The EVC is defined by both floristic and structural attributes as well as ecological processes that may be characteristic of that environment (Woodgate *et al.* 1996). The EVC represents a classification system higher than the floristic community level (Parkes *et al.* 2003).

1. Vegetation stand occurs on a headland system 2
1. Vegetation stand occurs on a dune system 3
1. Vegetation stand occurs elsewhere (ie. neither on a headland nor a dune system) in the coastal (i.e. within 10 km of the coast) landscape ..... **not Coastal Moonah Woodland**

2. Vegetation stand occurs on a headland system and consists of a wind-pruned shrubland or (otherwise) low shrubland to 2 m tall ..... **Coastal Headland Scrub** (EVC 161)
2. Vegetation stand consists of a tussock grassland that may contain an emergent shrub layer ..... **Coastal Tussock Grassland** (EVC 163)

3. Vegetation occurs on the foredunes/primary dunes of ocean and bay beaches 4
3. Vegetation occurs on the secondary or tertiary dune system 5

4. Vegetation is a grassland with halophytes present..... **Coastal Dune Grassland** (EVC 879)
4. Vegetation forms a low shrubland (canopy dominated by shrubs, < 4 m tall) ..... **Coastal Dune Scrub** (EVC 160)

5. Canopy consists of Coast Banksia *Banksia integrifolia* subsp. *integrifolia* over tall shrubs of Coast Tea-tree *Leptospermum laevigatum*. Scramblers such as Bower Spinach *Tetragonia implexicoma* and Seaberry Saltbush *Rhagodia candolleana* subsp. *candolleana* are common in the shrub layer ..... **Coast Banksia Woodland** (EVC 2)
5. Canopy not dominated by Coast Banksia *Banksia integrifolia* subsp. *integrifolia* **6**

6. Vegetation occurs as a closed shrubland on exposed situations on the upper slopes and crests of secondary dunes and dominated by Coast Wattle *Acacia longifolia* var. *sophorae* and Coast Tea-tree *Leptospermum laevigatum* ..... **Coastal Dune Scrub** (EVC 160)
6. Vegetation not as above, occurring on the sheltered upper slopes and/or swales in the dune system .....**Coastal Alkaline Scrub** syn. **Calcarenite Dune Woodland** (EVC 858).....7

7. Vegetation occurring in the dune swales, with a predominantly grassy structure and dominated primarily by grasses (mainly Common Tussock-grass *Poa labillardieri*) ..... **Floristic Community: Calcareous Swale Community** (undescribed)
7. Not as above **8**

8. Less than 75% of the total vegetation cover is provided by weeds. *Pimelea serpyllifolia* or *Acacia uncifolia* present and either Moonah *Melaleuca lanceolata* subsp. *lanceolata*, Coast Tea-tree *Leptospermum laevigatum*, or Coast Beard-heath *Leucopogon parviflorus* dominate the canopy. Usually occurring in dune swales on lower slopes and/or upper south-facing slopes behind the primary dune system ..... **Floristic Community: Coastal Moonah Woodland**
8. Greater than 75% of the total vegetation cover is provided by weeds ..... **Potential and indeterminate Coastal Moonah Woodland**

Key 2: Transition States of Coastal Moonah Woodland

This key is a guide to the transition states likely to occur for Coastal Moonah Woodland in the Gippsland Plain Bioregion. The transition states should be used as an *indication* only. The key is not intended to be applicable to small patches of vegetation and should be utilised within a wider context (one hectare) of the surrounding vegetation occurring on similar substrates and in similar topographic settings.

1. Closed Coast Tea-tree *Leptospermum laevigatum* dominating the canopy 2
1. Not as above 4

2. Closed Coast Tea-tree *Leptospermum laevigatum*-dominated canopy with Panic Veldt-grass *Ehrharta erecta* dominating the field layer **TS1**
2. Not as above 3

3. Coast Tea-tree *Leptospermum laevigatum*-dominated canopy, abundant mosses present in the field layer, substantially lacking *Ehrharta erecta* **TS2**
3. Coast Tea-tree *Leptospermum laevigatum*-dominated canopy, with Coast Wirilda *Acacia uncifolia* present **TS3**

4. Moonah *Melaleuca lanceolata* subsp. *lanceolata* dominating the canopy with *Daucus glochidiatus* common in the field layer in the cooler parts of the year, frequently with abundant woody weeds, notably *Polygala myrtifolia* or *Rhamnus alaternus* **TS4**
4. Not as above 5

5. Moonah *Melaleuca lanceolata* subsp. *lanceolata* dominating the canopy, Common Tussock-grass *Poa labillardierei*, White Elderberry *Sambucus gaudichaudiana* and Small-leaf Bramble *Rubus parvifolius* present in the field layer **TS6**
5. Moonah *Melaleuca lanceolata* subsp. *lanceolata* dominating the canopy, *Austrodanthonia* spp. dominant in the field layer. *Erharta erecta* present,

Descriptions of Coastal Moonah Woodland Transition States

The following transition state descriptions are ***indications*** of the condition and community dynamics of Coastal Moonah Woodland and thus should be used as a *guide only*. The transition states are only applicable to plant communities either identified as previous or current Coastal Moonah Woodland. Thus they consider transition to 'High Quality Coastal Moonah Woodland' and include vegetation that is already Coastal Moonah Woodland, as well as vegetation that may not yet be reasonably classified as Coastal Moonah Woodland but is (re-) nascent Coastal Moonah Woodland. It must be remembered that vegetation is a continuum. An individual stand may show some of the characteristics of Coastal Moonah Woodland at the same time as it also shows some of the characteristics of (degraded) transition states.

Under the correct management regime the majority of the transition states documented here have high regeneration potential due to soil stored seed. Some species may *appear* absent from the community but may be present in the soil seed bank. Thus it is recommended that communities classified as Potential Coastal Moonah Woodland or degraded/disturbed Coastal Moonah Woodland be subject to soil seed bank studies to determine the true species richness of the community.

Species that are likely to be present in the soil seed bank and that regenerate rapidly include: Coast Wirilda *Acacia uncifolia*, Thyme Riceflower *Pimelea serpyllifolia* subsp. *serpyllifolia*, Coast Beard-heath *Leucopogon parviflorus*, Rare Bitter-bush *Adriana quadripartita*, Slender Bush-pea *Pultenaea tenuifolia*, Running Postman *Kennedia prostrata*, Silky Guinea-flower *Hibbertia sericea*, Small-fruit Fan-flower *Scaevola albida* and a number of *Senecio* species.

Transition States (TS)

TS1 to TS3: Closed Coast Tea-tree *Leptospermum laevigatum*-dominated canopy

These sites presumably once supported a higher density (to dominance) of *M. lanceolata* subsp. *lanceolata*, but due to (former) land clearance, including the loss of Drooping She-oak *Allocasuarina verticillata*, other disturbances, combined with a lack of fire for at least a few decades, *L. laevigatum* became dominant.

TS1 – Panic Veldt-grass *Ehrharta erecta* dominates the field layer; indicating past mowing and grazing. Does not include sites subject to former heavy application of fertilizers. This community state may have a diverse seed bank and may regenerate to higher quality Coastal Moonah Woodland if the appropriate management regime is undertaken.

TS2 – Mosses abundant in the field layer with little to no Panic Veldt-grass *Ehrharta erecta*. Site likely to have tuberous orchid species. This community state is likely to have a diverse seed bank and is likely to regenerate to high quality Coastal Moonah Woodland if the appropriate management regime is implemented.

TS3 – Coast Wirilda *Acacia uncifolia* present and scattered individuals of Moonah may be present. This state is likely to be a midden or lime kiln site.

TS4 to TS6: Moonah *Melaleuca lanceolata* subsp. *lanceolata*-dominated canopy

TS4 – Abundant mosses and Austral Carrot *Daucus glochidiatus* present in the field layer (this annual is not apparent in summer) with weedy species such as Myrtle-leaf Milkwort *Polygala myrtifolia* present. This community state is likely to have a diverse seed bank (including *Acacia uncifolia*) and is likely to regenerate to good quality Coastal Moonah Woodland if the appropriate management regime is implemented.

TS5 – *Austrodanthonia* species dominating the field layer with *Ehrharta erecta* present. Indicative of past mowing. Likely to regenerate to High Quality Coastal Moonah Woodland if mowing ceases and appropriate management regime applied.

TS6 – Common Tussock-grass *Poa labillardierei*, White Elderberry *Sambucus gaudichaudiana* and Small-leaf Bramble *Rubus parvifolius* and/or Coastal Sword-sedge *Lepidosperma gladiatum* present in the field layer. Usually occurring on damp south facing low elevation lenses. Can have a high degree of weed cover.

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One Hundred Years Ago

THE DARWIN-WALLACE CELEBRATION

The Linnean Society of London has just issued a most interesting record of the Darwin-Wallace celebration, held on 1st July last. The meeting was arranged for the purpose of celebrating the fiftieth anniversary of the joint communication made' by Charles Darwin and Alfred Russel Wallace to the society on 1st July, 1858, entitled—"On the Tendency of Species to formVarieties, and on the Perpetuation of Varieties and Species by Natural Selection". In addition to the fellows, foreign members, and associates, invitations were issued to certain distinguished naturalists, every university in the United Kingdom, and to societies publishing on subjects of biology, the result being a great attendance of interested persons, including Dr. Wallace and several members of the Darwin family. The president of the Linnean Society, Dr. Dukinfield H. Scott, presided, and briefly outlined the object of the meeting, and then called on Dr. Wallace to receive the first Darwin-Wallace medal, instituted in commemoration of the event, and alluded to the self-sacrificing position Dr. Wallace had always taken in relation to the great theories first made public in the paper of 1858.

Dr. Wallace, who was received with great enthusiasm, replied at some length, and in doing so took the opportunity of detailing the actual relations between Darwin and himself prior to July, 1858, in order to correct the misapprehensions of popular writers as to what his share in Darwin's work really amounted to. He said he had even been credited with being the first discoverer, whereas the idea had occurred to Darwin in October, 1838, nearly twenty years before it had occurred to him, in February, 1858. Darwin had spent the twenty years in collecting evidence, conducting original observations and experiments, the results of which would be found in his "Origin of Species" and especially in that wonderful storehouse of knowledge his "Animals and Plants under Domestication". In 1844 Darwin had outlined his views to his friends Sir Charles Lyell and Dr. (now Sir Joseph) Hooker. The former strongly urged him to publish an abstract of his theory, in case some other person should precede him, but he always refused, on the plea that he had not got together all the materials for his great work. Then without any warning Lyell's prediction came true, for in June, 1858, he (Dr. Wallace) had forwarded to Darwin a letter, asking him to hand an essay enclosed, "On the Tendency of Varieties to Depart Indefinitely from the Original Type", to Sir Charles Lyell for publication if deemed suitable.

Continued on page 53